

# Impact of Neem Leaf Meal as a Feed Supplement in Poultry

**Dr. Gayathri S. Lal<sup>1</sup> and Dr. Arun Kumar Panda<sup>2</sup>**

<sup>1</sup>Department of Livestock Production and Management,  
College of Veterinary Sciences and Animal Husbandry, Bhubaneswar  
Odisha University of Agriculture and Technology, Odisha-751003  
<sup>2</sup>Principal Scientist, ICAR-CIWA, Bhubaneswar, Odisha-751003



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## Background

Poultry is one among the fastest growing sectors of India. Chicken contributes the lion's share to poultry production in India owing to 95% of the total egg production. Feed cost accounts for 65-70% of total cost of production in broilers and 75-80% for layers. Majority of the population in India still subsists in villages and they are getting access only to 25% of total poultry products as commercial poultry farming is limited to urban and semi urban areas. In this context, the major setback of high feeding cost for the small scale farmers in the villages, keeping handful of the birds require a boost up.

Poultry products and its by-products have tremendous potential to enhance the nutrient stability in any household, be it in rural or urban areas. Thus, economic cum healthy production of these little birds obliges and Neem is an ideal choice for it. Neem, a large evergreen fast growing perennial tree is having medicinal as well as nutritive value for poultry. Neem leaves have been found to be useful in relieving pain, fevers, infections and other complaints that it has been called the "village pharmacy".

Scientific studies showed that the inclusion of neem leaf meal in the diet of broilers, layers and other birds showed significant enhancement in their immunity, decreased cholesterol levels and increased body weight gain. Also, neem leaves can be used as an alternative to the antibiotic growth promoter in the poultry ration. Henceforth, it's high time that poultry industry must explore to include Neem as a feed supplement in the ration.

## Introduction

Poultry Industry, one of the major role players of Livestock sector, having the highest growth rate is facing one set back ahead their ultimate success, i.e. growing feed cost. The annual egg production, the per capita availability of eggs per annum and growth rate of egg production has reached 88139 million, 69 eggs, and 6.28%, respectively in the year 2016-17 (AHS series-18) in India. Also, the consumeristic health conscious societies of the modern day are looking forward for the intake of low antibiotic residue items in their menu. In this context, Neem leaf meal (NLM) is an ideal candidate for the poultry industry to make their production economically viable and environmentally sustainable.

*Azadirachta indica* (Neem) belongs to the family Meliaceae, a tropical evergreen tree which is widely distributed in Asia, Australia, Africa and other parts of the world. Neem, a fast growing tree, grows in an extensive array of soils and it is a robust tree which can flourish in poor dry soils without irrigation. Neem tree is also known as the nature's gift to mankind, the tree for many occasions, the tree of the 21st century and a tree for solving global problems.

The short, usually straight trunk has a moderately thick, strongly furrowed bark that has a garlic-like odour and a bitter, astringent taste. The Neem plant is rarely leafless and is usually in full foliage even during months of prolonged drought. It is grown from the southern tip of Kerala to the Himalayan hills, in tropical to subtropical regions, in semi-arid to wet tropical regions, and from sea level to about 700 metres (NRC, 1992).

## Why Neem?

Neem is one of the very few shade-giving trees that thrive in drought-prone areas. In India, Neem trees are been commonly used for shade lining streets, around temples, schools and other such public buildings or in most people's back yards, both in urban and rural areas. Neem products have been used in India for over two millennia for their medicinal properties. Neem contains a vast array of biologically active compounds which are chemically diverse and structurally complex. Biologically active principles isolated from different parts of the plant include: azadirachtin, meliacin, gedunin, salanin, nimbin, valassin and many other derivatives of these principles.

Miliacin forms the bitter principles of its leaves (NRC, 1992). These compounds belong to natural products called triterpenoids (Limonoids). The active principles are slightly hydrophilic, but freely lipophilic and highly soluble in organic solvents like, hydrocarbon, alcohols, ketones and esters (NRC, 1992). Various parts of the tree have medicinal value. Also Neem possesses protolimonoids, tetranortriterpenoids, pentanortri-terpenoids, hexanortriterpenoids, and some non terpenoid. Neem leaves exhibit immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties. Owing to these properties, neem leaf meal has been tried as a

feed additive in animals. An abundantly available biopolymer, Chitosan in combination with neem leaf meal can be supplemented in the diet of broiler chickens to reduce the abdominal fat.

In non-pesticidal management (NPM), neem is a key ingredient providing a natural alternative to synthetic pesticides. Also, it acts as an anti-feedant, repellent, and egg-laying deterrent, protecting the crop from damage. Neem cake is often sold as a fertilizer. Azadirachtina chemical in neem has positive effects on pests, and deformatory effects on viruses, mites, fungal pathogens, plant parasitic nematodes, intestinal worms, bacteria, molluscs, and protozoan parasites such as coccidian species (NRC, 1992). Ongoing research studies at ICAR- CIWA revealed that Neem is an ideal candidate to substitute antibiotics in the poultry ration.

### Medicinal Properties of Neem

Siddha and Ayurvedic practitioners claim that neem and its products are said to be having anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive, and sedative. Neem leaves have also been used to treat skin diseases like eczema, psoriasis; leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems. The leaf is also used for birth control and to cause abortions. The bark is used for malaria, stomach and intestinal ulcers, skin diseases, pain, and fever.

The flower is used for reducing bile, controlling phlegm, and treating intestinal worms. The *A. indica* leaf exhibits a wide range of pharmacological activities viz., anti-inflammatory, anti-hyperglycaemic, anti-ulcer, anti-malarial, anti-fungal, anti-bacterial, anti-viral, anti-oxidant, anti-mutagenic anti-carcinogenic, immunomodulatory and various other properties without showing any adverse effects. Azadirachtaindica leaves also contain compounds with proven antimicrobial activity.

The antimicrobial activity of extracts of neem leaves against such micro-organisms as *Staphylococcus* spp., *Streptococcus* spp., *Pseudomonas* spp. and *Escherichia coli*, and some fungal strains have been reported (Valarmathy et al., 2010). The extract of the Neem leaf is reported to possess diverse pharmacological characteris-

tics such as anti-inflammatory, hypolipidaemic, immunostimulant, hepatoprotective and hypoglycaemic effects. Being accepted by consumers as natural additives, phyto-genic and herbal products have received increased attention in the recent years. Earliest ayurvedic literature refers to the benefits of all parts of neem tree including fruit, leaf, bark, flower and root.

### Neem – An Alternative

Health conscious consumeristic society associate diet with the probability of experiencing health problems or diseases. The growth and expansion of the poultry industry is confronted by high cost of feed and drugs and their occasional shortages. However, there is the fear that the reckless and continuous sub-therapeutic use of in-feed antibiotics could lead to the development of antibiotic resistant bacteria, which is harmful to human beings.

Thus, efforts have been made in different parts of the world to ban the inclusion of all types of antibiotic growth promoters in animal feeds. The utilization of leaf meal feed ingredient as alternative is not new but the inclusion level at various ages and physiological conditions varies. The green plants have long been acknowledged as the inexpensive and most copious impending source of proteins because of their capacity to produce amino acids from a wide range of fundamentally boundless and readily available primary materials. However the inclusion of antibiotics in livestock rations as feed additives is being discouraged because of the negative effect on the animals and the humans who consume the final animal products (HCWH, 2005).

Thus, there is the need to appraise potential antibiotic alternatives to improve disease resistance in intensive food animal production. Neem, owing to its wide range of beneficial effects can be substituted for Antibiotics in the poultry ration. Furthermore, scientists and researchers are trying to combat against fatal diseases in poultry through the use of medicinal plants, containing the most active ingredients to promote growth, weight gain and immune-stimulant.

### Composition of Neem leaf meal

The nutrient composition of Neem leaf meal is 9% moisture, 20.52% crude protein (CP); 16.45% crude fibre (CF); 4.25% ether extract (EE); 7.00% total ash and 42.78% nitrogen free



extract (NFE). Leafmeal contained macro minerals (per cent) that is Ca (0.71), P (0.28), Mg (0.75), Na (0.58) and K (2.00) and microminerals (ppm) that is Cu (34), Zn (18), Fe (745), Co(10), Mn (60), Cr (0.8) and Pb (27) (Ansari et al., 2012).

**Supplemental effect of Neem leaf meal on Poultry**

Extensive researches have been carried out in chickens about the supplemental effect of neem leaf meal. Studies reported that broilers fed diets supplemented with 2.5 g/kg of Neem leaf meal had significantly greater body weight, highest dressing percentage, improved feed efficiency at 28 and 42 days of age. The daily weight gain at 42 days of age was improved from 3.61 to 8.96% in broilers fed diet supplemented with leaf meal than antibiotic (Ansari et al., 2012). Also, Neem leaf meal fed to broilers gave live performance levels similar to those of the antibiotic growth promoter and observed improvements of 8.1% in daily gain and 7.7% in feed conversion ratios in 17-day-old poults. Tipu et al. (2002) reported similar effects, where he used salinomycin and *A. indica* fruit as feed additive and anti-coccidial

in broilers and reported better results in terms of weight gain.

Studies showed that the supplementing neem leaf powder @ 1-2g/kg in the ration significantly improved the body weight gain and FCR in broilers. The rise in weight gain is due to the presence of macro and micro minerals in *A. indica* leaf meal. The higher body weight gain in broilers consuming leaf meal could also be due to its appetite and digestion stimulating, anti-bacterial and hepato-protective properties, which aid to lessen the microbial load of birds and enhanced the feed consumption and feed efficiency of the birds indicating Neem as an ideal substitute to the existing antibiotic growth promoter. Further studies revealed a significant progress in relative weight (liver, heart and gizzard) when adding the neem leaves powder to drinking water by 40 ml/l. The greater bursa and thymus weight in birds supplemented leaf meal suggests that leaf meal supported these lymphoid organs. The leaf meal potentiated immune response in the experimental broilers and caused a marked increase in the weight of lymphoid organs (Ansari et al., 2012).

Serum and tissue cholesterol levels were observed to decrease progressively with increasing dietary levels of *A. indica* leaf meal. This reduction in serum cholesterol level of broilers fed leaf meal diets possibly propose a general decrease in lipid mobilisation. This is due to the indirect inhibitory effects exerted by the neem leaf meal at the levels of HMG-CoA reductase, a key enzyme in cholesterol biosynthesis. This suggests that leaf meal diets were capable of dropping serum cholesterol, thereby helping to reduce the deposition of cholesterol in the skin and muscles. This correspondingly indicates that *A. indica* leaf meal should be used to produce animal product with reduced cholesterol content.

The reduction in total cholesterol in serum reflects the hypocholesterolemic properties accredited to the defatted part of the leaves which are rich in fibrous content and may block intestinal cholesterol absorption. The liver functioning, after the supplementing of neem leaf meal was studied and the decreased activities of SGOT, SGPT and ALP in serum evidenced the positive effect of leaf meal on liver parenchyma of the birds. Scientists verified that *A. indica* leaf meal is a promising hepatoprotective agent and this protective activity of leaf meal is due to its anti-oxidant and normalisation of impaired membrane function activity.

Also, the *A. indica* leaves contained quercetin and rutin compounds which are extensively studied bioflavonoid in the class of flavonols. It is well-established that quercetin, one of the most abundant flavonoids, is a more powerful anti-oxidant than the other anti-oxidant nutrients such as Vitamin C, Vitamin E and  $\beta$ -carotene. The maximum tolerance level of Neem leaf meal 10% in starter broilers but 15% in laying birds. The proximate composition of neem leaf meal indicated it as a good source of protein with crude protein values range of 18.10-20.68%. The bioactive principles in Neem leaf meal can be reduced by sun drying. Shihab et al., 2017 reported that Neem leaf powder supplemented @ 2g/kg had a positive role to improve immunity against Newcastle Disease and Infectious Bursal Disease and the qualities of productivity and physiological for broiler chicks.

Haematological parameters indicates the physiological status of birds and its deviation can be utilized in assessing the response of birds to various physiological situations The high concen-

tration of Hb in birds fed diets of leaf meal is due to hepato-stimulatory and hepatoprotective effects of leaf meal resulting in the synthesis of more Hb in the bone marrow which is under the control of erythropoietic factors released by hepatic cells. Nutritional factors affect the blood profiles of birds and this implies that up to 2.5% inclusion of leaf meal had a positive effect on the relative quantity of blood cell as well as total volume of blood.

Serum proteins are involved in transport of important body substances, and maintenance of normal distribution of water between blood and tissues through osmotic pressure. Serum protein content were found to be elevated in birds fed leaf meal at 2.5% levels (Ansari et al., 2012). Also, studies revealed an increase in yellowish colour of cockerel shanks, deeper egg yolk colour, and increased hen-day egg production with increase in Neem Leaf Meal inclusion.

### Conclusion

*Azadirachta indica*, commonly known as neem, has attracted worldwide attention in recent years, owing to its wide range of medicinal properties. Based on the research studies carried out, it may be concluded that Neem leaf meal can be included in the diets of broiler chicks up to 2.5 g/kg without any deleterious effects on their performance, serum biochemical constituents and haematological indices.

The use of antibiotics in boilers should be discouraged and can be replaced with Neem leaf meal. Moreover, the dietary supplementation of Neem leaf meal may lead to the development of low-cholesterol chicken meat as demanded by health-conscious consumers. Also, neem leaf meal can be used as an alternative by the poultry sector for antibiotics.

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